EFFECT OF HEAVY VEHICLES PERFORMANCE TOWARDS FEDERAL ROAD : A CASE STUDY OF FEDERAL ROAD 3

NUR HANANI AMIRAH BINTI RAPAR

B. ENG(HONS.) CIVIL ENGINEERING

UNIVERSITI MALAYSIA PAHANG

SUPERVISOR'S DECLARATION

I/We* hereby declare that I/We* have checked this thesis/project* and in my/our* opinion, this thesis/project* is adequate in terms of scope and quality for the award of the Bachelor Degree of Civil Engineering

_____

(Supervisor's Signature)

Full Name :

Position :

Date :

_____

(Co-supervisor's Signature)

Full Name :

Position :

Date :

STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

_____

(Student's Signature)

Full Name :

ID Number :

Date :

EFFECT OF HEAVY VEHICLES ON THE PERFORMANCE OF FEDERAL ROAD : A CASE STUDY OF FEDERAL ROAD 3

NUR HANANI AMIRAH BINTI RAPAR

Thesis submitted in fulfillment of the requirements
for the award of the
Bachelor Degree in Civil Engineering

Faculty of Civil Engineering and Earth Resources

UNIVERSITI MALAYSIA PAHANG

JAN 2019

ACKNOWLEDGEMENTS

Foremost, I would like to thank my family and friends who have supported me while I have been completing my research. Especially my family, Nor Hayati binti Ab Razak and Nur Ain binti Rapar who have always convinced me in my study, who always give me a motivation and inspiration for me to accomplish my final year proect.

I would like to express my sincere gratitude to my supervisor, Puan Azlina Binti Haji Ismail for the continuous support of my research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better advisor and mentor for my research. And last, but not least, thank you to everyone at UMP especially Staff in Highway and Traffic Lab that always helping me on lab and on site to complete these research..

ABSTRAK

Walaupun bilangan kenderaan berat dalam aliran lalu lintas hanya sedikit peratusan, kesannya menonjol. Kenderaan berat mengenakan kesan fizikal dan psikologi ke atas aliran lalu lintas yang disebabkan oleh ciri-ciri panjang dan saiz (fizikal) dan percepatan / penurunan (operasi) ciri-ciri. Kajian ini dijalankan untuk mengkaji keseriusan kemerosotan jalan raya dan untuk menilai tahap Perkhidmatan (LOS) bagi kemudahan untuk menampung permintaan kenderaan berat bagi keadaan semasa (2018) dan keadaan ramalan masa depan (2020). Kajian ini dijalankan dengan menggunakan kaji selidik pengamatan visual dan tinjauan jumlah lalu lintas. Untuk mencapai ini, Federal Road 3 dipilih sebagai lokasi pengajian. Terdapat dua lokasi yang dikenal pasti yang menghubungkan ke wilayah pantai timur untuk Stesen 1 dan menghubungkan ke pelabuhan untuk Stesen 2. Kemudian, data akan diperoleh dari dianalisis menggunakan kaedah penilaian penilaian jalan raya dan analisis prestasi operasi. Hasilnya menunjukkan bahawa tahap kecacatan dan penarafan jalan adalah (Kedudukan A: sangat memuaskan) untuk Stesen 1 dan (Kedudukan C: kurang memuaskan) untuk Stesen 2. Walaupun untuk analisis prestasi operasi keputusan tersebut menunjukkan bahawa LOS diperolehi di Stesen 1 dalam keadaan sekarang adalah LOS C manakala untuk masa depan adalah LOS D.. Berbanding dengan Stesen 2, kedua-dua hasil mendapatkan keadaan sekarang dan masa depan menunjukkan LOS A.

ABSTRACT

Although the number of heavy vehicles within the traffic stream is only a small percentage, their impact is prominent. Heavy vehicles impose physical and psychological effects on surrounding traffic flow because of their length and size (physical) and acceleration/deceleration (operational) characteristics. Prior to these issues, this study is conducted to investigate the seriousness of road pavement deterioration and to evaluate the Level of Services (LOS) of the facilities to accommodate traffic demand of heavy vehicle for both present condition (2018) and future forecast condition (2020). This study was conducted by using visual observation survey and traffic volume survey. To achieve this, Federal Road 3 was chosen as study location. There will be two identified locations which is link to east coast region for Station 1 and link to port for Station 2. Then, data obtained from the sites were analyzed using road rating assessment method and operational performance analysis. The result revealed that the disability level and road rating for Station 1 was (rating A : very satisfactory) and (rating C : less satisfactory) for Station 2. While for operational performance analysis the result revealed that LOS obtain at Station 1 in present condition is LOS C while for future condition is LOS D. Comparing to Station 2, the both result obtain for present and future conditions show LOS A..

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

FFS	Free Flow Factor
LOS	Level of Services
D	Density

LIST OF ABBREVIATIONS

FFS	Free Flow Factor
LOS	Level of Services
HCM	Highway Capacity Manual
BFFS	Base Free Flow Speed
fLW	Adjustment of lane width
fLC	Adjustment of lateral clearance
fM	Adjustment of median
fA	Adjustment of assess point
Vp	Flow Rate
fHV	Factor Heavy Vehicles
PHF	Peak Hour Factor
D	Density

CHAPTER 1

INTRODUCTION

1.1 Research Background

Malaysia has identified mineral resources of barite, bauxite, clays, coal, copper, gold, ilmenite, iron ore, limestone, monazite, natural gas, petroleum, silica, silver, struverite (tantalum), tin, and zircon (Tse, 2016). During the 20th century, mineral production played an important role in Malaysia's national economy after many years of exploitation. Malaysia has a long past of mining, exclusively tin, but until very recent times it scarcely listed on global markets as a source of mineral. That changed suddenly in January 2014, when, in an attempt to enhance its own aluminium-smelting industry (Wan Junaidi Tuanku Jaafar, September 2016).

In Kuantan, the active mineral mining is located in Gebeng, Pahang. The mine while strengthening the economy and as well helping as a profitable source of earnings for many people, is also bring about intense suffering to the local people. Mineral activity indeed has causes the pollution around Bukit Goh, Gebeng and Kuantan Port. For months, certain areas in the district, particularly Bukit Goh, have underwent serious air pollution from mineral dust and residue released by the processing plants or leaked during transportation to Kuantan Port. Mineral dust and residue also has polluted and damaged the road (Malaysiakini, January 2016).

Other than that, few fatal accidents also happened caused by lorries transporting of mineral. Lorries for transporting mineral also has caused traffic congestion as the drivers parked their lorries on the road. Other than that, many potholes have occurring because of mineral transportation activity on the road surface where it can cause an accident to road user. Moreover 24 accident have been recorded since it operation. About 200 trips are made in a day, from the mines to Kuantan which has make the roads are badly damaged by the lorries (Andansura Rabu, January 2016). This is happening because most of the lorries are carrying more than they should. This activity has caused the roads heading to the port are pockmarked with potholes and it is dangerous for the user (Khaidir Ahmad, June 2014). Even though they may be using the designated routes, these public roads go through neighborhoods and urban areas. Some of the accidents are caused by lorries driver that trying to rush their loads to the port, as they are paid according to the number of trips they make. Therefore, this research is done by evaluated the impact of heavy vehicles distribution towards road pavement deterioration and determine the performance of existing level of service multilane highways when being generated by the heavy vehicles operation.

1.2 Problem Statement

Malaysia's basically unregulated mineral mining industry has boomed in the past two years to encounter the demand from top aluminum producer China, filling in a resource gap after Indonesia banned exports (Reuters, September 2016). The development of the mineral industry has made Kuantan also led to the growth of new industries that generate state and population revenues. Along with these developments, the increase in the number of vehicles for the transportation of bauxite has also increased. Problems arising from the development of this industry have posed a danger to road accidents and road surface. This activity has caused the roads heading to the port are pockmarked with potholes and it is dangerous for the user.

Moreover, the boomed of this industry has causes several road accidents involving lorries transporting mineral, which some of it were fatal. The changes of road surface such as potholes also occur along with these developments where it has changed the condition of the road surface. The reason to this changed is due to high demand

from outside the country and also caused by lorries driver who trying to hurry to freight their mineral to the port, as they are rewarded according to the number of journeys they make. This research will focus on the impact of heavy vehicles distribution towards road pavement deterioration and determine the performance of existing level of service multilane highways when being generated by the heavy vehicles operation. There will be two station chosen to represent the effect of heavy vehicles distribution towards federal road performance.

1.3 Objective

The aim and objective of this case study is to analyses the effect of heavy vehicles distribution along Federal Route 3 Jalan Pintasan Kuantan – Pelabuhan (AH18). To achieve the aim of this study, the following objectives have been set follow:

i. To assess the impact of heavy vehicles distribution to road pavement deterioration
ii. To evaluate the LOS of the facilities to accommodate traffic demands of heavy vehicles for both present and future condition

1.4 Scope of Study

The scope of this research has been determined to ensure the literature study is focusing at certain field. This research will be focus on:

1. The location selected is Kuantan Baypass Federal Route 3 (AH18), a main highway baypass
2. The starting point for visual observation for road deterioration will be 3 km at Station 1and 3 km at Station 2
3. Metro count will be installed at Station 1 and Station 2 to obtained traffic volume data
4. Highway Capacity Manual (HCM 2010) was used to determine the Operational Analysis in terms of LOS

REFERENCES

A.Sultan, D. S. (2015 -2016). Highway Maintenance and Safety . *Transportation* , PP113 - 130.

Abdullah, N. I. (14 January, 2016). Bauxite Mining Unhealty Effect on People Enviroment .

Academy of, S. M. (2017). *Sustainable Mining : A case study for Bauxite Mining in Pahang* . Kuantan Pahang : Academy of Science Malaysia .

Achmad Wicaksono, R. E. (2015). Type of Road Pavement Damage for Road on Peatland, A Study Case in Palangka Raya, Central Kalimantan, Indonesia. *IOSR Journal of Enviromental Science, Toxicology and Food Technology*, 53-59.

Bai, Y., Schrock, S. D., Mulinazzi, T. E., Hou, W., Liu, C., & and Firman, U. (2010). *Estimating Highway Pavement Damage Costs.* Kansas: U.S. Department of Transportation Research and.

Bombay, D. T. (19 February , 2014). Multilane Highway .

Dougherty, N. W. (2008). TRAFFIC CAPACITY OF HIGHWAYS. 1-48.

Faradiella Mohd Kusin, M. S. (2016). The occurrence and potential ecological risk assessment of bauxite. *Research Article* , PP 1- 16.

Fatma, S., Mohamad, B., Ahcmad, W., & Rustam, E. (December, 2015). Types of Road Damage for Road on Peatland, A study Case in Palangka Raya, Central Kalimantan, Indonesia . *Volume 9*(Issue 12 Ver III), PP 53 - 59.

Hamidi, S. Q. (June , 2012). Effect of Bauxite. *Logistic routing towards Kuantan Transportation System*, pp. PP 427-436.

Hussain, N. H. (2016). Psychosocial and health impacts of bauxite mining among Felda Bukit Goh communities in Kuantan, Malaysia. *International Journal of Public Health and Clinical Medicine*, PP 174-189.

Imani, N. (14 January , 2016). Bauxite Mining Unhealty Effect on People and Enviroment .

Karim Chatti, H. S. (2018). Effect of Heavy Vehicle Trucks with Large Axle Groups on Asphalts Pavement Damages. *Proceedings 8th International Symposium on Heavy Vehicle Weights and Dimensions* .

Lana, K. (11 July, 2015). Bauxite Issue in Kuantan . *Transportation* .

M.E.Zumrawi, M. (March - April , 2016). Investigating Causes of Pavement Deterioration in Khartoum State. *Journal of Civil Engineering and Technology (IJCIET), Volume 7*(Issue 2), PP 203 - 214.

Mohamed, A., S.Y.Umar, D.Samson, & T.Y.Ahmad. (May - June , 2015). A Case study of some Federal Roads in Bauchi State : The Effect of Pavement Condition on Traffic Safety . *Journal of Mechanical and Civil Engineering* , PP 139 -148.

Noor, H. A., Norlen, M., Lokman, H. S., Thahiratul, A. Z., & Daud, A. R. (February , 2016). Potentila Health Impact of Bauxit Mining in Kuantan . *Journal of Enviromental Science*, PP 1-8.

Online, M. M. (7 January , 2016). Pothole - Riddled road add to red woes. *Road is stained red by bauxite due to truck transportation* , pp. PP 1 - 6 .

Pretoria. (April, 2008). *THE DAMAGING EFFECTS OF OVERLOADED HEAVY VEHICLES ON ROAD.* Department of Transport .

Rafeeq Ameen Kattiparuti, A. M. (July, 2017). Evaluation of Flexible Pavement Failure - A Case Study. *International Journal of Advanced Engineering, Management and Science (IJAEMS), Volume 3*(Issue - 7), 741 - 749.

Rao, T. V. (3 May, 2008). Introduction to Transportation Engineering .

Reem Salim, N. K., & Koya, A. M. (July, 2017). Evaluation of Flexiblr Pavement Failure . *Journal of Advanced Engineering Management and Sources (IJAEMS), Volume 3*(Issue 7), PP1 - 56.

Reuters, T. (7 September, 2016). Malaysia Extends Bauxite Mining ban until year end . pp. PP 1-14.

Shalini, K., Puchika, A., Bhupali, D., Pooja N., B., Ajit, P. S., & A.K.Sarkar. (2016). Road Safety Analysis using Multi Criteria Approach . *Transportation Research* , PP 1-15.

Sharad.S.Adlinge, & Gupta, P. A. (2012). Pavement Deterioration and its Causes . *Journal of Mechanical and Civil Engineering* , PP 09 - 15.

Sivanandam, H. (9 April, 2016). Felda Bukit Goh settlers hope bauxite mining will be allowed again soon. *Standart Operation Procedure* .

T.N.Alagesh. (14 August , 2017). Bauxite stockpiles will remain in respective location, guarded around the clock . *Bauxite stockpiles* , pp. PP 1-3.

Tse, P. K. (November, 2016). The Mineral Industry of Malaysia. *2013 Mineral Yearbook*, 17.1.